

**IN THE CLAIMS:**

1. (Currently Amended) An electrochemical sensor comprising:

a sensor electrode array;

an operating electronic unit integrated on a chip for operating the sensor electrode array and for processing electrical signals received therefrom, the operating electronic unit including a potentiostat circuit and a microprocessor receiving and further processing signals processed by the operating electronic unit, said potentiostat circuit being a digital control circuit whose controller function is controlled by said microprocessor, said microprocessor being integrated on the chip of said operating electronic unit;

a memory with stored operating parameters of said sensor electrode array, said microprocessor reading parameters from said memory to carry out a control algorithm depending on the parameters to measure substance concentration.

2. (Cancelled)

3. (Currently Amended) An electrochemical sensor in accordance with claim 2 1, wherein said microprocessor determines operating parameters of said sensor electrode array by performing test functions before the sensor is put into operation and at regular intervals to adapt said control algorithm to same in order to continue to measure substance concentration.

4. (Currently Amended) An electrochemical sensor comprising:

a sensor electrode array;

an operating electronic unit with a digital control circuit including an analog to digital converter connected to said array, a digital to analog converter connected to said array, and a  
5 microprocessor with a control algorithm connected to digital connections of said analog to digital converter and said digital to analog converter to form a potentiostat circuit with said microprocessor receiving and processing signals; wherein said microprocessor, said analog to digital converter, and said digital to analog converter are integrated on a single chip, said microprocessor determining operating parameters of said sensor electrode array by performing  
10 test functions before the sensor is put into operation and/or at regular intervals and to adapt the control algorithm to same.

5. (Original) An electrochemical sensor in accordance with claim 4, further comprising a multiplexer connecting at least one of said analog to digital converter to said array and said digital to analog converter to said array, said multiplexer being integrated on said single chip.

6. (Currently Amended) An electrochemical sensor in accordance with claim 4, further comprising

a memory with stored said operating parameters of said sensor electrode array, said microprocessor reading parameters from said memory to carry out said control algorithm  
5 depending on the parameters.

7 - 11 (Cancelled)

12. (Previously Presented) An electrochemical sensor arrangement comprising:

a plurality of measuring heads arranged at spaced locations from each other, each of said measuring heads includes a sensor electrode array, and an operating electronic unit with an analog to digital converter connected to said array, each said operating unit also including a digital to analog converter connected to said array, and a microprocessor connected to said analog to digital converter and to said digital to analog converter, said microprocessor processing signals from said array with a control algorithm to measure substance concentration at said array, said control algorithm operating said analog to digital converter and said digital to analog converter to form a potentiostat, said microprocessor, said analog to digital converter and said digital to analog converter being integrated on a single chip, each of said measuring heads including a digital network interface connected to said microprocessor;

a network bus system connected to said network interface of said measuring heads;

a central unit connected to said network bus system for repetitively monitoring said plurality of measuring heads.

13. (Previously Presented) A sensor arrangement in accordance with claim 12, wherein:

said network bus system is an Ethernet network.

14. (Previously Presented) A sensor arrangement in accordance with claim 12 wherein:

a power supply for said operating electronic unit is taken from said network interface.

15. (Previously Presented) A sensor arrangement in accordance with claim 12 wherein:  
said network bus system is one of the Internet or an Intranet.

16. (Previously Presented) A sensor arrangement in accordance with claim 12,  
wherein:

said each measuring head includes a memory storing parameters of a respective said  
measuring head, said control algorithm of a respective said measuring head using said  
5 parameters to operate the operating unit, a respective said microprocessor repetitively measures  
and updates said parameters, and stores said parameters in said memory.

17. (Previously Presented) A sensor arrangement in accordance with claim 13 wherein:  
a power supply for said operating electronic unit is taken from said network interface;  
said network bus system is one of the Internet or an Intranet;

said each measuring head includes a memory storing parameters of a respective said  
5 measuring head, said control algorithm of a respective said measuring head using said  
parameters to operate, a respective said microprocessor repetitively measures and updates said  
parameters, and stores said parameters in said memory.